IV.A.12 Integrated Short Contact Time Hydrogen Generator

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Objectives

- Develop a reformer-based hydrogen generating system capable of delivering 60 kg/day of hydrogen.
- Develop compact, cost-effective and high efficiency reformer.
- Identify more durable catalysts.

Technical Barriers

The integrated short contact time hydrogen generator project at GE Global Research addresses the following technical barriers from the Hydrogen Production section of the Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan:

- A. Fuel Processor Capital Cost
- B. Fuel Processor Manufacturing
- C. Operation and Maintenance (O&M)
- D. Feedstock Issues
- F. Control and Safety
- L. Durability
- M. Impurities

Technical Targets

The integrated short contact time hydrogen generator project at GE Global Research has a goal of constructing and demonstrating a pilot plant reformer. The reformer will attempt to meet the DOE 2010 technical targets of \$1.50/kg H_2 and 75% total energy efficiency.

GE Global Research will build the pilot scale reformer for demonstration of the advanced concepts found by performing the systems analysis. This pilot scale unit will produce 60 kg/day of hydrogen.

Approach

In order to meet the technical and economic goals, GE Global Research has been analyzing different reforming system designs to develop the most compact and cost-effective reformer system. The analysis will provide insight into the fundamental scientific challenges in reforming. GE will also develop new catalysts for reforming independently as well as collaborating with our partners University of Minnesota and ANL. In summary, our approach includes:

- Analyze different system designs.
- Design a 60 kg/day pilot-scale hydrogen production system.
- Fabricate and operate the hydrogen generator.
- Develop a control system for safe operation of the hydrogen generator with low O&M cost.
- Quantify the efficiency and cost of the system.

Accomplishments

- Completed the design of a laboratory-scale catalytic partial oxidation, steam methane reformer, and water-gas-shift test unit.
- Completed the preliminary system analysis and designs.
- Completed the process flow diagram of the 60 kg/day pilot plant.
- High-pressure system selected (economical in product scale).
- Designed and sized most of the components of the pilot-plant. Preliminary heat exchanger sizing, design completed.
- Completed the process instrumentation diagram of the pilot-plant; preliminary control strategy is defined.
- Non-disclosure agreements with Sud Chemie Inc, CRI Catalyst Company, Johnson Matthey, Engelhard ready to sign.
- Completed preliminary cost analysis.
- Scopes of work for partners are defined.
- Filed two U.S. patent applications so far.